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Sovereign credit revisions impact on the European Economy

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Abstract

This research aims to find the direction of causality between rating revisions and economic growth in Europe during 2002-2015. Based on a system-GMM, developed by Arellano and Bond (1995), the-Standard & Poor's-sovereign rating revisions' effects on economic growth, controlling for other determinants, will be estimated. Rating revisions are shown to Granger cause output growth throughout the whole time-frame considered and no reverse causality was verified. We find evidence that rating revisions do impact economic growth while outlook announcements do not. More open economies look to have upgrade revisions effects on growth boosted, while negative revisions effects are dampened. Whilst analyzing the crisis outbreak impact, we perceived that the upgrade revisions' effect on economic growth were halved.

Keywords: Sovereign credit revisions, upgrade, downgrade, economic growth, system-GMM.

1-Introduction

Sovereign credit rating(SCR) is the debt valuation of a country or sovereign entity to assess a borrower's capacity and willingness to honor its current and future debt obligations fully and on time, this, as a risk measure, assists investors by setting a price on their money as loans are made. These rankings are proposed by credit rating agencies, such as, Standard & Poor's, Moody's or Fitch that use a combination of economic, social and political variables to determine the fluctuations of these grades. Beyond these purpose, Reinhart (2002) states that SCR are also valuable in predicting sovereign distress, or even defaults, as it determines the terms and the extent to which countries have access to international capital markets. Negative sovereign rating revisions are associated with increases in sovereign bond yields, increased volatility in financial markets and significant spillovers in debt markets. Rating upgrades give rise to credit default swaps discount, and decreases of sovereign bond spreads, normally these events reflect optimistic expectations of macroeconomic conditions. Now, facing the recent records of the sovereign debt crisis all around Europe[1], raised by unsustainable debt accumulations[1], the analysis of variables that directly affect how countries can leverage the economy and through which economic growth can be boosted, seems to us of extreme importance. Trying to analyze whether macroeconomic fundamentals are reflected in re-rating decisions, raises the question of the order of causality. Are these last decade downgrade revisions in sovereign credit rating and outlook a result of poor economic performances, the opposite, or have we reached a vicious cycle? Negative rating announcements create uncertainty and distrust in financial markets, thus pressing sovereign bond yields up, which together with the governments higher cost of capital, result in fiscal sustainability issues, unbearable levels of interests on debt and decreasing capital inflows (flight-to-quality argument). So, to which extent are rating revisions harming economic growth?

Initially we employed a Panel VAR framework using rating upgrades, rating downgrades and GDP per capita growth rate series. Employing the Inessa Love package in

[1] European economy saw public debt levels reach historical levels, Greece around 177% of GDP, Italy 132%, Portugal 130% and Cyprus 105% just to name a few.

STATA we analyzed Granger causality by performing t-tests on the lagged variables' coefficients in each of the resulting three equations. Then we used the standard system generalized method of moments (system-GMM), developed by Arellano and Bond (1995), to investigate whether SCR revisions impact on re-rated countries' economic growth, controlling for a set of fundamental economic variables. Standard OLS[2] estimation is also considered for the sake of comparisons.

This research aims to find the direction of causality between rating revisions and economic growth in Europe. Rating revisions are shown to Granger cause output growth throughout the 2002-2015 period, no reverse causality was verified. We find evidence that rating revision do effect economic growth while outlook announcements do not. More open economies look to have upgrade revision effects on growth boosted, while negative dampened. While analyzing the crisis outbreak effect, we see that the upgrading effects on economic growth are cut in more than half of its previous value.

The rest of the paper is organized as follows. Section 2 presents a short literature review, section 3 explains the data gathering and estimation strategy, empirical results are reported in section 4 and finally, section 5, provides some concluding remarks and policy implications.

2-Literature Review

There has been an alight debate over the utility of Credit rating agencies (CRA). The standard theory behind CRA's existence is that they correct a problem of information asymmetry, assisting investors' decision-making, and fact regulate investments.

Literature provides a lot of research on the determinants of sovereign credit rating (SCR) and on the determinants followed by the different CRA, namely Standard & Poor's, Moody's and Fitch -Cantor and Packer (1996) concluded that different agencies follow the same criteria on attributing SCR grades. Longstaff (2011) inferred whether SCR is determined by country-specific risk or else by macro indicators, this study occurred in a high liquidity period (2000-2010) which may be biasing results, however the author concluded that macro

[2] OLS coefficients must be handled with reasonable caution- as endogeneity may bias results.

variables determined SCR in the period analyzed. The most cited variables are GDP growth, inflation, fiscal and external balance-. Cantor and Packer (1996) and later (Afonso 2011) distinguished between short and long-run determinants pointing out the importance of the political risk index's, external debt and default history on the long-run settlement of ratings. More recently Soudis (2017) indicated that policies constraining the public sector, as rule of law or independence of the central bank, to be the more robust variables in determining assessment revision.

Stock markets behavior resulting from SCR revisions gather most research regarding this thematic. As sovereign bond yields serve as benchmark for interest rates in borrowing countries, the increase in credit default swaps instigated by downwards revisions in sovereign rating- Brooks et al., (2004) and Ismailescu and Kazemi (2010), increases volatility in bond markets, while positive credit rating announcements are shown to have insignificant effects on yields and CDS spreads see e.g., Reisen and von Maltzan (1999) and Remolona and Wooldridge (2006). Indeed, such volatility may exacerbate the level of financial instability and its unpredictability, since high volatility levels are associated with higher risk perception of market participants, which results in spillover effects harming spreads of sovereign bonds worldwide, see for instance, - Gande and Parsley (2005), Afonso et al. (2012). Christiansen (2007) using a GARCH model reports evidence on US and European bond market spillovers. Still concerning volatility, Afonso (2014) uses a panel of daily sovereign bond returns to illustrate, through an EGARCH specification, that only bad news (downgrades) produce instability in bond markets while upgrades do not have significant effects on volatility. All these effects are amplified for countries rated below the investment grade threshold[3], recalling that these countries are prohibited to harvest pension and money market funds.

Regarding the predictive power of CRA, Rogoff (2003) defined SCR as a summary measure of a country's likelihood to default, Reinhart (2002) related this with currency crisis, asserting that these should be preceded by downgrades, yet, empirical research, concluded that CRA fail to anticipate currency crisis and these downgrades are instead ex-post events

[3] Following Standard & Poor's scale, countries rated below BBB-, are in a "speculative grade" category.

(Amadou 2004). The same author while concluding that CRA fail to anticipate currency crisis, recognizes that these agencies do predict debt crisis, defining debt crisis as sovereign distress, reaching the threshold of a 1,000 basis point higher spread, countries experience reduced capital market access and high cost of external debt. Baum et al. (2016) revealed that CRA downgrade revisions had no impact on the value of the euro currency nevertheless, it does increase exchange rate volatility and European bond spreads. This re-priced sovereign bond reached all Europe and instated a climate of fear. The subjective side of CRA attributions on SCR is biasing default predictions in the wrong direction by creating and exasperating sovereign debts (Vernazza 2015), a fact supported by the Eurozone peripheral countries' conditions, that are stuck in a "diabolic loop" (-see Runnemede et al. 2011) between the observed high levels of debt, a red flag to CRA on assessing SCR grades, and low levels of economic growth, avoiding agencies to change perspective.

Acharya et al. (2011) describe a two-way feedback effect between sovereign risk and banking risk, which generates co-movement in the default risk of the two sectors-. BIS (2011) highlight two timely channels of reverse causality between these sectors, firstly in case of bank bailouts, sovereign, targeting financial stability may drain out public resources, worsening the financial markets context as investors perceived a 'credit risk transfer' from bank to sovereign. The second channel reflects the role of banks in supporting economic growth through intermediated financing. In this sense, a weakened banking sector constrains economic growth, a vital variable on assessing SCR. Alsakka (2014) explores the "sovereign-bank" channel, displaying evidence that SCR downgrades damage bank's healthiness, thus greatly contributing to bankruptcy-. This evidence is denoted after the crisis and is more pronounced in the GIIPS countries.

This research's aim is to fill the gap between rating announcements and economic growth, demystifying macroeconomic variables' responses to revisions and understanding the transmission channel(s) where by, in fact, agencies can interfere in real economic activity. Drago and Gallo (2017) draw the sovereign-corporate analogy to explain that firms, facing deterioration in credit conditions caused via SCR downgrades, will substantially reduce domestic investment and spread tight credit conditions to unrated firms. Foreign direct investment arrives to worsen economic conditions, changes in capital flows may be explained by a flight-to-quality argument, here the investor will reweight his portfolio shifting capital

away to safer investments in the face of stress in international financial markets, Bernanke et al. 1996), Hartmann et al. (2004) and Caballero and Krishnamurthy (2008) relate severe episodes of flight-to-quality with unpredictable market conditions and not only about assets payoffs, to confirm this theory one can recall the subprime crisis in the US (2008) or even the recent past in peripheral countries in the Eurozone affected by the sovereign debt crisis. Reinhart and Rogoff (2004) seeking the answer Lucas (1990) paradox that more capital does not flow from rich countries to poor countries, asserts that credit market conditions and political risk are the main determinants of capital flow decisions, arguing that the quality of institutions, social factors and economic environment play a crucial role on investors decisions. Warnock and Warnock (2005) revealed capital flow's importance on long-term interest rates in the US, showing that without any foreign flows, the 10-year Treasury yield would be 150 basis points higher in their research period, reducing systematic risk (Chari and Henry -2004-) and increasing both physical investment (Henry, 2003), thus economic growth (Bekaert, Harvey and Lundblad 2005).

The unbearable levels of debt accumulation, which following Boumparis et al. (2015) acquired greater relevance after the crisis burst, on risk assessing, all around Europe and the fact that downgrade revisions in SCR increased the debt-burdens is nowadays a huge concern, Tamegawa (2016) relates that, if the debt/GDP ratio assumes a high sensitivity to CRA negative announcements, it could lead to excessive instability and this ratio may explode. Chen (2016) gathering a panel of 103 developing and developed countries, explores the effect of SCR revisions on output growth of re-rated and exhibits evidence that one-notch upgraded (downgraded) re-rated countries have an increase (decrease) of 0.6% (0.3%) of the five-year average annual growth rates, still, proves that high levels of external debt amplify the effect of negative rating announcements on economic growth. In turn, the same author, supports Andresen and Valenzuela (2015) who showed that countries with greater financial openness will have a rewarded benefit when positive announcements occur.

3-Data and methodology

This research gathered a panel of 28-euro area countries (still including United Kingdom), see table 5 in the appendix, and 14 years of yearly data, from 2002-2015. We collected S&P sovereign credit rating and outlook revisions for long-term foreign currency-denominated debt, using trading economics website, and constructed four dummy variables denoting upward and downward revisions for both events, to analyze these effects on economic growth. The credit rating agency's choice hangs on the highest revisions frequency by S&P (compared with Moody's and Fitch), hence providing a larger data set. These rating and outlook credit revision are presented in the appendix. Our sample reflects 171 events, of which 86 positive and 85 negatives in the period under analysis. To isolate these events' effects, we used a set of control variables following economic growth models theory, accounting for standard economic, debt level, demographic, political and international trade variables.

Table 1, summarizes the descriptive statistics for all variables, see the appendix table 6 for variables construction understanding, to begin our analysis in a transparent background.

Table 1: Descriptive statistics

	Observations	Mean	St.Deviation	Minimum	Maximum
5-years average GDP per capita growth	392	1.818	2.790	-5.697	20.144
GDP per capita growth	392	1.849	4.018	-14.560	25.637
Rating up	392	0.130	0.337	-	-
Rating down	392	0.140	0.348	-	-
Outlook up	392	0.089	0.286	-	-
Outdown	392	0.077	0.266	-	-
Government Expenditure	392	19.880	2.795	12.549	28.064
Inflation	392	2.491	2.516	-4.480	22.537
Fertility rate	392	1.535	0.222	1.170	2.060
Investment in capital formation	392	22.957	4.667	9.832	41.648
Institutions Quality	392	1.208	0.426	-0.070	1.920
Years of schooling	392	15.814	1.255	12.500	19.200
Openess Trade	392	115.518	63.687	45.609	391.497
Tradedeficit (dummy)	392	0.591	0.492	-	-
High openness trade country(dummy)	392	0.288	0.454	-	-
High openness*Rating up (Int.)	392	0.031	0.172	-	-
High openness*Rating down (Int.)	392	0.041	0.198	-	-
Below Investment Grade country (dummy)	392	0.156	0.363	-	-
Net external debt	280	28.319	47.725	-156.724	128.228
High external indebted country (dummy)	280	0.350	0.478	-	-
High external*Rating up (Int.)	280	0.036	0.186	-	-
High external*Rating down (Int.)	280	0.093	0.291	-	-

Dummy variable means hints the number of observations within the sample. Thresholds for countries to be considered has High opened and Highly indebted calculated within the sample equals, 138,8 % of GDP and 61,8% of GDP. Int. is the abbreviation for interaction.

To study the causality between economic growth and rating revisions, we modelled this relation as a tri-variate equation, and performed a Granger causality tests, (see Granger 1961) to observe if past values of one variable help predicting the other.

Thus, the equations are:

$$Growth_{j,t} = \propto_1 + \sum_{i=1}^{n} \beta_i Growth_{i,t-i} + \sum_{i=1}^{n} \beta_{.i} Ratup_{i,t-i} + \sum_{i=1}^{n} \beta_{..i} Ratdown_{i,t-i} + \varepsilon_{i,t}$$

$$Ratup_{j,t} = \propto_2 + \sum_{i=1}^{n} \delta_i Growth_{i,t-i} + \sum_{i=1}^{n} \delta_{.i} Ratup_{i,t-i} + \sum_{i=1}^{n} \delta_{..i} Ratdown_{i,t-i} + \mu_i$$

$$Ratdown_{j,t} = \propto_3 + \sum_{i=1}^{n} \theta_i Growth_{i,t-i} + \sum_{i=1}^{n} \theta_{.i} Ratup_{i,t-i} + \sum_{i=1}^{n} \theta_{..i} Ratdown_{i,t-i} + e_{it}$$

Here $Growth$ stands for the one year GDP per capita growth rate, $Ratup$ and $Ratdown$ are the already mentioned binary variables. At this stage, we will apply some econometric routines (Pooled OLS, System-GMM) to model the rating announcements' impact on economic growth, introducing a well-timed set of control variables presuming robust findings.

The model

The liaison between sovereign rating/outlook revisions and economic growth may suffer from a reverse causal effect i.e. rating agencies may decide when to revise grades basing the decision on economic growth performance (Mellios and Paget-Blanc 2006) whereas the opposite may also occur. Time-invariant effects, such as geography and demographics may be correlated with the explanatory variables. This translates into the possibility of endogeneity problems that may be mitigated using -system GMM- (Arellano and Bover ,1995; Blundell and Bond 1998) that ensures unbiased estimators. System GMM, employed to capture the link between SCR revisions and economic growth, is derived from the estimation of a system of two simultaneous equations, one in levels (with lagged first differences as instruments) and the other in first differences (with lagged levels as instruments) this model opposing the differenced-GMM has decent finite sample properties, which is pertinent to our research, given that, we have a larger country set, N, than yearly observations, T, and because we will break the time series in the international crises year (2008) increasing the gap between N and T.

b) System GMM

Our dynamic panel approach, system GMM, will ease any inconsistency caused, perhaps, by endogeneity problems. The model is specified as:

$$AvgGrowth_{i,t,t+4} = \beta_0 y_{t-1} + \beta_1 RatUp_{i,t} + \beta_2 RatDown_{i,t} + \beta_3 OutUp_{i,t} + \beta_4 OutDown_{i,t}$$

$$+\propto X_{it} + \eta_t + \varepsilon_{i,t} ,$$

$$i = 1, \dots, n ; t = 1, \dots, T \qquad (1)$$

$AvgGrowth_{i,t,t+4}$ stands for the mean of the real per capita GDP growth for country i, from period t to t+4, this variable uses overlapping data to maximize the time-series (Bekaert 2001,Harvey and Lundblad ,2005, and Panniza and Presbitero 2014), still, in order to use this variable until 2015 we forecasted each country's real GDP per capita growth rate up to 2019 through an autoregressive process using STATA software, this criteria, of averaging growth rates, was preferred so as to cross of any business cycles outcome. We follow BAKAERT (2011) and Panniza and Presbitero (2014), and include the lagged logarithm of real GDP per capita , y_{t-1}introducing the initial state of GDP growth, Note that this initial state of GDP per capita will never be overlapping the dependent variable. $RatUp_{i,t}$ $RatDown_{i,t}$ $OutUp_{i,t}$ $OutDown_{i,t}$represent our rating and outlook revisions dummy, denoting 1 if any of these events occur and 0 otherwise, rating and outlook revisions may arise in the same year. The set of control variables is denoted by X_{it} , finally η_t represents year-specific dummies to control cross-country correlations that may be induced by time trends in the error terms. All data specifications are in the Appendix. The disturbance term is represented as:

$$\varepsilon_{i,t} = \mu_i + \mathrm{e}_{it}$$

where $\varepsilon_{i,t}$ denotes the error term, μ_i is the unobservable country-specific effect, that may be correlated with the explanatory variables, and e_{it} is the idiosyncratic shock. To avoid possible endogeneity problems resulting between μ_i and the explanatory variables, following Arellano and Bond (1991), one will use first-differences to eliminate country-specific effects that are not time-varying. After accounting for the fixed effects, system GMM, to avoid the still existent correlation between the differenced lagged dependent variable and the disturbance process, which now is an MA (1). System-GMM augments a first-differences

GMM, with the levels equation adding instruments to the model. In this equation variables are instrumented with their own differences.

We make use of robust standard errors that are consistent under panel-specific autocorrelation and heteroskedasticity in one-step estimation. The estimation reports three additional tests: Arellano Bond AR(1), AR(2) and Hansen tests. The Arellano Bond test for autocorrelation has a null hypothesis of no autocorrelation and is applied to the differenced residuals. The test for AR(2) is peremptory, because if it detects autocorrelation in levels (thus rejecting the null) , the model is invalid. The Hansen J statistic ascertains whether "the instruments as a group are exogenous", thus for the sake of validity, the higher the p-value the better.

Variables Choice

Dependent Variable

$AvgGrowth_{i,t,t+4}$ – Supported from the Granger causality hypothesis, rating announcements will affect economic growth, consequently we constructed a five years average GDP per capita growth, as a dependent variable, we use a five year average to purge any business cycle effect. Overlapping to maximize the time-series. Forecast estimation is employed, allowing the research to have this variable constructed up until 2015.

Rating variables

We expect positive rating/outlook revisions to have a positive impact on economic growth while negative announcements to have negative correlation with output growth.

Control variables

We have divided the set of control variables into two subgroups, one for the country specific features (1), the later for the trade relations with the rest of the World (2), due to model specification that effortlessly explodes the number of instruments.

Initial GDP per capita -This variable is used to control for the convergence effect (catch-up effect). We assume that countries with lower levels of per capita GDP have propensity to grow faster than the ones with higher levels, thus we expect this coefficient to be negative.

Government Expenditure - The relation between growth and the government size in the economy is ambiguous, in an "homogeneous" panel such as the European union 28, there are examples of positive and negatives effects of public expenditure on growth.

Inflation - There is an alight debate over the inflation impact on economic growth, and about the bounds through which this variable will boost or harm GDP, ergo, in this panel set with moderated levels of inflation, following -Barro (2013)-, we expect a negative link between these series, as inflation harms growth via the investment channel.

Fertility - We expect fertility to be positively correlated with growth.

Trade openness - Here we attempt to measure the degree of economic openness, spotting the amount of international trade which occurs in a country. High levels of internationals trade interaction are associated with liberal trade policies, this notch of globalization is helpful towards growth purpose.

Investment in capital formation – We expect gross capital formation to have a positive increment in the direction of the dependent variable.

Institutional Quality - This variable drive is to reinforce economic performance, as it measures the institutions efficiency on promoting private sector development, thus we expect a positive link between these.

Years of Schooling - Education is expected to boost long-run economic expansion.

Trade dummy- Here, we are studying the effect of trade deficits on average growth, and we expect negative links.

Below investment threshold dummy- Assuming Standard & Poor's gradation, countries rated below BBB grade. We suppose that states in this conditions have a downwards gap on average growth.

High External debt dummy- This variable is expected to denote lower growth values for high external indebted countries, as the foreign dependence is negatively correlated with economic performance, plus interests paid on debt obligations play a huge role on contemporaneous European economics.

GIIPS dummy- A trial to empirically find that the peripheral countries have lower average growth.

4-Estimation results

To study causality between variables, we performed a panel VAR, using the Inessa Love routine[4], and applied a classic t-test to each variable's first lag in all three equations. Observing Table 1, equation (1) displays that all lagged variables are significant, which is to say positive and negative rating announcements Granger cause output growth, if positive (negative) SCR announcements take place, GDP growth will tend to increase (decrease), as all variables are statistically significant at the 1% significance level. Regarding equation (2), the null hypothesis that growth does not Granger cause positive events, is not rejected and there is evidence that the occurrence of SCR upward revisions in time t will increase the probability by 0.238 probability points of positive announcements in t+1, while negative announcements seem to decrease that same likelihood by 0.272 probability points. In equation (3) there is similar behavior, i.e., growth does not Granger cause negative revisions and negative announcement contribute to higher downward announcements in the following year (0.452), whereas positive announcements seem to have negative impact on negative events occurrence (-0.142) this coefficient is statistically significant at a 1% significance level. Equation 2 and 3 show that the lagged economic growth variable does not Granger cause none of the SCR revisions.

[4] Inessa Love and Michael Abrigo developed a Stata package for Panel VAR estimation, VAR framework allow us to perform Granger causality test.

Table 2 : PVAR estimation

	Per capita GDP growth (1)	Rating up (2)	Rating down (3)
$per\ capita$ GDP growth$_{t-1}$	0.348***	0.0005	0.003
	(0.081)	(0.007)	(0.007)
Rating up$_{t-1}$	2.026**	0.238**	-0.142***
	(0.816)	(0.121)	(0.037)
Rating down$_{t-1}$	-3.715***	-0.272***	0.452***
	(1.135)	(0.088)	(0.132)
Number of countries	28	28	28
Observations	336	336	336

P-Values * p<0.10, ** p<0.05, *** p<0.01
Standard error reported in parentheses.
No higher lags are reported for lack of significance.

There is clear evidence that it is rating announcements that cause growth and not the opposite, therefore the next estimation resort to output growth as the dependent variable. The next table, displays the resulting pooled OLS and system-GMM estimation results. (1) presents country-specific features, and (2) focusses on foreign relations, namely debt and trade variables. Finally, the interactions equations specify how, high openness and high external indebted countries, respectively, have SCR announcements amplified or supported by these evidences.

Table 3: Relation between economic growth and rating revisions. System GMM and OLS estimation					Interactions			
	OLS	System-GMM	OLS	System-GMM	OLS	System-GMM	OLS	System-GMM
	(1)	(1)	(2)	(2)	(OPENNESS)(3)		(EXTERNAL DEBT)(4)	
log(l.GDP per capita)	-2.683***	-2.505***	-2.126***	-2.275***	-1.228***	-1.125**	-1.436***	-1.377***
	(0.246)	(0.484)	(0.227)	(0.6)	(0.158)	(0.457)	(0.144)	(0.392)
Rating up	1.531***	1.698***	1.094***	1.377***	0.786*	1.228	1.289***	2.162***
	(0.311)	(0.521)	(0.307)	(0.471)	(0.402)	(0.798)	(0.399)	(0.726)
Rating down	-0.635**	-0.722**	-0.579**	-0.601	-1.659***	-1.827***	-1.572***	-2.041**
	(0.292)	(0.301)	(0.287)	(0.5)	(0.356)	(0.471)	(0.574)	(0.945)
Outlook up	0.769**	0.832	1.041***	0.23	1.032***	0.957	1.058***	0.125
	(0.335)	(0.731)	(0.33)	(0.722)	(0.378)	(1.033)	(0.366)	(0.799)
Outlook down	-0.017	0.216	-0.407	-1.064*	-0.158	-0.422	-0.685*	-1.401
	(0.351)	(0.451)	(0.375)	(0.555)	(0.4)	(0.548)	(0.414)	(0.925)
Gov. Expenditure	-0.207	-0.187						
	(0.041)	(0.114)						
Inflation	-0.036	0.006						
	(0.059)	(0.092)						
Openess	0.010***	0.010***						
	(0.002)	(0.003)						
Fertility	2.319***	2.222**						
	(0.559)	(0.973)						
Investment	-0.051*	-0.065*						
	(0.027)	(0.035)						
Institutions Quality	1.906***	1.677***						
	(0.394)	(0.637)						
Expected Years of Schooling	0.449***	0.430*						
	(0.097)	(0.244)						
Below investment grade			-0.995***	-0.915**				
			(0.34)	(0.396)				
Tradedeficit			-0.966***	-0.995**				
			(0.258)	(0.439)				

GIIPS			-0.522*	-0.425				
			(0.307)	(0.533)				
High Openess			0.633***	0.616*				
			(0.196)	(0.358)				
High External debt			-0.521**	-0.564				
			(0.242)	(0.353)				
High Openess*Rating up					3.180***	1.436		
					(0.686)	(1.36)		
High Openess*Rating Down					1.743***	1.486**		
					(0.594)	(0.548)		
High External Debt*Rating up							0.058	-1.132
							(0.584)	(0.775)
High External Debt *Rating Down							0.434	1.081
							(0.633)	(1.08)
Observations	364	364	252	252	364	364	252	252
Number of countries	28	28	28	28	28	28	28	28
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AB test of AR(2) (p*)		(0.79)		(0.85)		(0.42)		(0.931)
Hansen-Test of overid. Restrictions (p*)		(1)		(1)		(1)		(0.87)

P-Values * p<0.10, ** p<0.05, *** p<0.01

Estimation performed using STATA 14.0, using Pooled OLS and System-GMM through xtabond2 routine developed by David Roodman (2006)

Robust Standard errors adjusted for panel-specific autocorrelation and heteroskedasticity are reported in parentheses, constant term not reported.

Table 1[5] reports the results for the Arellano-Bond test and the Hansen test of overidentifying restrictions. The serial correlation tests show no trace of higher-order correlation having all p-values for AR (2) larger than 0.05 which does not reject the null-hypothesis of no serial correlation. Regarding the instrument set, the test validates the GMM instruments methodology with p-values equal or near unit.

We first assess whether rating and outlook announcements are determinants of economic growth. To evaluate their consistency, we defined 4 equations, first controlling for country specific characteristics, such as the size of the public sector or institutions quality, secondly for country inter-relations, for instance external dependencies. Finally we constructed two equations composed by economically sound interactions to evaluate if having a) a more open economy and b) higher external debt levels, amplifies or dampens the SCR effects on average growth.

All columns from table 1 manifest positive coefficients for upgrade rating revisions and negative coefficients for rating downgrade, in all equations the results are significant, at least at a 5% significance level.

Equation (1) displays consistent results while analyzing the OLS[6] vs GMM estimation output, positive rating announcements shows to have a positive and significant (at 1% significance level) correlation with average growth. When positive announcements occur the average growth in the subsequent five years is expected to be 1.698 (1.531) percentage points higher, negative rating announcement appear to, under a 5% significance level, decrease economic growth by 0.722 (-0.635) percentage points. On what seems to be a constant behavior throughout all equations, outlook revisions do not have significant impact on GDP growth, the exception is, in the Pooled OLS estimation where upward outlook revisions do seem to have positive impact growth, constantly less then positive rating announcements. All coefficients behave as expected and quoted above, excluding from these the Investment in capital formation that displays a negative, significant at a 10% significance level, coefficient

[5] All coefficients regarding the initial state of GDP are negative and significant, which means that the convergence hypothesis holds.

[6] OLS coefficients are reported in parentheses, unless otherwise stated.

which can only be interpreted as bad investment decisions, supposedly taken place during the time-frame, might not have provided benefits to economic growth. To denote the interesting institutions quality coefficient, strongly significant and positive, suggesting that the interaction between the public and private sector has a huge importance on economic development.

In the second equation, we control for what we ponder to be the inter-relation characteristics comparing countries debt levels and dependencies. The results, although with some fluctuations, are robust. Positive rating announcements increase economic growth by 1.377 (1.094) percentage points, whereas negative revisions decrease the dependent variable by 0.579 in the OLS estimation, system-GMM ignores the significance of these variable. The below investment grade dummy has a significant, under a 1% significance level, which means that average economic growth tends to be almost 1 percentage points lower for countries rated below the BBB- notch. Similar results are found for countries having deficit in the trade balance.

We analyzed if Portugal, Ireland, Italy, Greece and Spain (GIIPS) have significant different average growth performances than the remaining panel, but the null hypothesis that there is no statistically difference between performances stands. Economies with larger degree of openness seem to boost economic growth, while we fail to prove that higher indebted countries have their GDP growth with high levels of foreign leverage, this failure hangs on variable construction with many missing values.

Following Chen (2016), in these last equations, we add two interactions terms to each equation, upgrade and downgrade revisions while country i is categorized as high openness (1) and high external debtor (2) at time t. As for the third specification, the rating up coefficient per se loses significance nevertheless the interaction High Openness*Rating up in the OLS estimation is significant, at a 1% significance level, and amplified by the countries openness. Negative rating announcements suffer an opposite impact while being highly open to the market, notice that the downgrade rating's coefficient equal to -1.827, and the added interaction amounts to 1.486, statistically significant at a 5% significance level, totals -0.341 that can be interpreted as the expected percentage points decrease in average growth produced by a downgrade to a highly commercial opened country. This result denotes weaker effects for negative announcement in all estimations. We resort to the flight-to-quality

argument to support these results, as economies with a higher degree of openness are more reliable for international markets. SCR revisions effects are improved by this feature.

Finally, we attempted to prove that high levels of external debt are harmful for average growth (scenario in equation (2)) and that SCR announcements would have an impaired outcome resultant from this. The reasoning behind this test is that a highly indebted country would be more sensitive to, essentially, downgrade events as the GDP portion to pay interest rises and governments get under creditors control. We fail to get these conclusions empirically, all coefficients regarding these interactions are statistically insignificant. We consider that this might be explained by data problems[7] or even by country specific external debt composition that is partially in IMF hands[8].

The crisis effect

The US subprime crisis burst in 2008 triggered damaging impact onto the financial system, specifically for our research purpose, on the sovereign debt market. The preceding period (before 2008) was characterized by large capital flows, economic growth (the panel's average equals 3.83%) and upgrading revisions. Contrasting with the following liquidity tightness, recession (0.36% growth average), rising unemployment and downgrades (67 out of our 85 events sample take place after the crisis) witnessed all around Europe. Countries such as Greece, Italy, Portugal or Spain stepped into a vicious cycle of rising yields, where their exploding sovereign debt led to downgrade rating announcements. As these states required funds to support economic development, they had to incur in higher costs to compensate for the riskier issued bonds. At this stage, state governments would need to grow, in time t, as much as the interest on debt in the same year, to hold debt levels intact. This was not the case and debt levels were growing, which in turn led to further downgrades. During our "after the crisis" period, ten out of twenty-eight countries saw their sovereign bonds classified as "junk" bonds. Vulnerable capital inflows are considering the most important transmission channel of crisis effects. Significant amounts of capital were driven off Europe, caused by low interest rates and risk perception, to Emerging markets investment opportunities.

Hereupon, we resorted to GMM estimation to understand the differences in rating announcements effects on average growth, before and after the crisis.

Table 4: Pre-vs post crisis period.
System-GMM estimation

	Rating up	After Crisis	Rating up*After Crisis	Rating down	Rating down*After Crisis	constant
	5.184***	-3.034***	-3.671***	-1.650**	0.957	2.552***
	(0.707)	(0.52)	(1.009)	(0.717)	(1.103)	(0.432)
Observations	392	Number of Countries		28	Time dummies Yes	
AB test for AR(2) (p*)		(0.525)	Hansen test of overid. Restrictions (p*) (0.99)			

P-Values * p<0.10, ** p<0.05, *** p<0.01

Table x reports the analysis for a pre vs post crisis period by adding the dummy "After Crisis". As expected, this dummy variable takes a negative coefficient, significant at a 1% significance level, demonstrating lower average growth after 2008 compared with the base group, 2002-2008.

We added two interactions, Rating up *After Crisis-and Rating down* After Crisis, to analyze whether there were swings in risk appetites during the European sovereign debt crisis. Observing the estimation results, one can conclude that the interaction regarding positive rating announcements and recent time-frame binary variable is negative and significant (without totally offsetting the positive upward revision coefficient), meaning that upgraded revisions had a smaller positive impact on average growth with the outbreak of financial crisis paralleling with pre-crisis period. This results can be supported with financial markets mistrust, as investors were dealing cautiously with good news. Rating down preserves a negative coefficient (-1.65), significant at a 5% level, though, our interactions exhibit no statistical significance

Conclusion

This research looks to fill the gap between sovereign credit rating revisions (using Standard & Poor's data) and economic performance, switching the focus from financial market

effects, and isolating the European sample for the 2002-2015 period. For this, we analyze SCR revisions' impact on a 5-year average growth to purge out any business cycle effect.

This research suggests that rating revisions are Granger causing economic performance and not the opposite. Past downgrade revisions increase the probability of new ones, and upgrades decrease the same likelihood. After the system-GMM interpretation, one can state that upgrade (downgrade) revisions positively (negatively) influences economic growth. Outlook revisions are shown to be statistically insignificant. These results are robust to the use of different control variables. Economic openness exhibited to be a beneficial indicator for a country to boost SCR positive effects and to lessen downgrade effects. Finally, the crisis outbreak analyses infer that comparing with the pre-crisis period, rating announcements are perceived more cautiously.

In the future, we hope to develop this study further to show that: 1) high external debt accumulations exponentially increases the debt to GDP sensibility to downgrade revisions, and 2) determine the transmission channels through which rating revisions impact economic growth, namely the interest rate / capital inflows channel.

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Appendix

Table 5

Table of countries

Austria	Estonia	Italy	Portugal
Belgium	Finland	Latvia	Romania
Bulgaria	France	Lithuania	Slovak Republic
Croatia	Germany	Luxembourg	Slovenia
Cyprus	Greece	Malta	Spain
Czech Republic	Hungary	Netherlands	Sweden
Denmark	Ireland	Poland	United Kingdom

Table 6:Variables description

Variable	Description	Source
5-years average GDP per capita growth	The dependent variable defined as the mean of the real per capita GDP growth for country i, calculated over a five-year period from t to t+4	Authors calculation
GDP per capita growth	GDP per capita growth rate	World Development Indicators
Rating up	Binary variable that equals 1 if there is an upward revision on rating grade in country i at time t, 0 otherwise	Trading Economics
Rating down	Binary variable that equals 1 if there is a downward revision on rating grade in country i at time t, 0 otherwise	Trading Economics
Outlook up	Binary variable that equals 1 if there is an upward revision on outlook in country i at time t, 0 otherwise	Trading Economics
Outdown	Binary variable that equals 1 if there is a downward revision on outlook in country i at time t, 0 otherwise	Trading Economics
Government Expenditure	Government expenditure level as a percentage of GDP.	World Development Indicators
Inflation	Inflation as measured by the consumer price index	World Development Indicators
Fertility rate	Total fertility rate represents the number of children that would be born to a woman if she were to live to the end of her childbearing years	World Development Indicators
Investment in capital formation	Gross capital formation (private and public investment in fixed assets, changes in inventories, and net acquisitions of valuables) as a percentage of GDP.	World Development Indicators
Institutions Quality	Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance).	Worldwide Governance Indicators.
Years of schooling	Expected Years of Education	World Development Indicators
Openess Trade	Sum of imports plus exports as a percentage of GDP.	World Development Indicators
tradedeficit (dummy)	Binary variable that equals 1, if country i denotes deficit on current account at time t, 0 otherwise	World Development Indicators
High openness trade country(dummy)	Binary variable that equals 1 if country i is in the top quartile (calculated within the sample) of external debt/GDP at time t, 0 otherwise.	Authors calculation
High openness*Rating up (Int)	High openness country having a upward revision	Authors calculation
High openness*Rating down (Int)	High openness country having a downward revision	Authors calculation
Below Investment Grade country (dummy)	Binary variable that equals 1 if country i is below investment grade (BBB)at time t, 0 otherwise	Trading Economics
Net external debt	A proxy for net external debt using official international investment position	"External Wealth of Nations" Dataset
High external indebted country (dummy)	Binary variable that equals 1 if country i is in the top quartile (calculated within the sample) of external debt/GDP at time t, 0 otherwise.	Authors calculation
High external*Rating up (Int)	High external indebted country having upward revision	Authors calculation
High external*Rating down (Int)	High external indebted country having downward revision	Authors calculation

Table 7: Rating and outlook, S & P, announcements in the 2002-2015 period

		Upgrade		Downgrade	
			(outlook-rating)		(outlook-rating)
Number	Country	Year	Frequency	Year	Frequency
1	Austria	2013o	1-0	2012,2012 o	1-1
2	Belgium	2014 o	1-0	2010 o,2011,2012 o	2-1
3	Bulgaria	2002, 2003, 2004, 2005, 2005 o,2006,2009 o	2-5	2008,2013 o,2014	1-2
4	Croatia	2004 o	1-0	2008 o,2010, 2012,2013 o,2014,2015 o	3-3
5	Cyprus	2007 o,2008,2014,2015	1-3	2010, 2011, 2012,2013,	0-4
6	Czech Republic	2005 o, 2007, 2010 o,2011	2-2		0-0
7	Denmark		0-0		0-0
8	Estonia	2003 o,2004,2005 o, 2010, 2011	2-3	2006 o,2007 o,2009	2-1
9	Finland	2002,2013 o	1-1	2012 o,2014,2015 o	2-1
10	France		0-0	2012,2013,2014 o	1-2
11	Greece	2003, 2012,2014	0-3	2004 o, 2009, 2010, 2011, 2012,2015	1-5
12	Germany		0-0		0-0
13	Hungary	2014 o,2015	1-1	2006, 2008, 2009, 2010 o,2011, 2012,2013 o	2-5
14	Ireland	2013 o,2014,2015	1-2	2009, 2010, 2011,2012 o	1-3
15	Italy		0-0	2003 o,2004, 2006, 2011, 2012,2013,2014	1-6
16	Latvia	2002,2003 o, 2004, 2010, 2011 o,2012,2013,2014	2-6	2007, 2008, 2009	0-3
17	Lithuania	2002, 2003,2003 o, 2004, 2005,2005 o,2010 o,2013 o,2014	4-5	2007 o,2008, 2009	1-2
18	Luxembourg	2013 o	1-0	2012 o	1-0
19	Malta	2015 o	1-0	2012,2013	0-2
	Netherlands	2015 o,2015	1-1	2012 o,2013	1-1
20	Poland	2004 o,2005 o 2007,2008 o	3-1		0-0
21	Portugal	2015	0-1	2004 o,2005, 2009,2009 o, 2010, 2011, 2012	2-5
22	Romania	2002, 2003, 2004, 2005,2005 o,2006 o,2014	2-5	2007 o,2008	1-1
23	Germany		0-0		0-0
24	Slovakia	2002, 2004, 2005, 2008,2008 o,2014 o,2015	2-5	2012	0-1
25	Slovenia	2002 o,2003, 2004, 2006,,2015 o	2-3	2010 o,2011, 2012,2013,2014 o	2-3
26	Spain	2003 o,2004,2013 o,2014,2015	2-3	2009 o,2009, 2010, 2011, 2012,2012 o	2-4
27	Sweden	2004	0-1		0-0
28	United Kingdom	2010 o,2014 o	2-0	2009 o,2012 o,2015 o	3-0
Total		35 outlooks up revisions,51 rating up revisions		30 Outlooks down revisons,55 rating down revisions	

"o" Denotes outlook revision